Does the use of social software predict our personality?

Xuan Qian
Renmin University of China

In the era of computer-mediated communication, different kinds of social software emerge in an endless stream. Social software, also known as social media platform or apps, generally facilitates collaborative behaviors, the organization and molding of communities, social interactions and feedbacks, and individual's self-expression based on the Internet (Allen, 2011). Examples of social software include WeChat, Weibo, Facebook, Twitter, Instagram. Social software has gained increasing popularity nowadays. In the first quarter of 2021, the number of monthly active users of Weibo reached 523 million, and that number of WeChat were 1.2 billion (Statista, 2021). The reasons for the huge popularity and success of social software derive mainly from its functions and benefits. It has social functions such as promoting information dissemination, strengthening interpersonal communication and etc. (Zuckerman, 2020). Individuals can express their emotions and opinions by sharing contents on social software. Evidence suggests that contents generated and shared on social software represent an extension of "one's self" and reflect the actual personality of its individual users (Back et al., 2010; Seidman, 2013). By analyzing the use of social software, the user's personality can be inferred.

Personality can be defined as a set of traits in behavior, cognition and emotion, which is distinctive among people (Mischel, Shoda & Ayduk, 2007). It is significant to test and understand an individual's personality, since we can apply it to conducting group performance (Kramer, Bhave & Johnson, 2014), predicting job leadership (Huszczo & Endres, 2017) and etc. In order to better formulate personality, researchers proposed the Five Factor Model（BIG5）(Costa & McCrae, 1992), which uses five broad domains or factors to describe the human personality, including openness to experience(O), conscientiousness (C), extraversion (E), agreeableness (A) and neuroticism (N) (see figure 1). Based on BIG5, existing studies have made rich statements of the strong relations between the use of social software and users' personalities (e.g., Bachrach, Kosinski, Graepel, Kohli, & Stillwell, 2012; Park et al., 2015). Azucar, Marengo & Settanni (2017) selected 28 papers on this issue, 19 of which experimented on Facebook, 5 on Twitter, 3 on the Sina Weibo micro-blogging site, and 1 article used a combined sample from Instagram and Twitter. These works mainly research on interactive tools, e.g., Social Networking Sites (SNS). Interactive tools focus on handling mediated interactions within a pair or group of users, establishing and maintaining connections among users, and facilitating the mechanics of conversation and talk (Allen, 2011). Liu and Campbell (2017) conducted a meta-analysis of 33 studies assessing the BIG5 and SNS activity. They found that extraversion was related to engaging in more interaction on SNS, posting a greater number of photographs, and having more SNS friends (i.e., social connections on the sites). Openness was related to information seeking (viewing one's news feed or others' profiles), photographs

posting and status updating. Neuroticism was associated with updating status more frequently. Agreeableness was related to posting more photographs, but spending less time on SNS in total. Conscientiousness was associated with a lower likelihood of information seeking and sharing. However, in addition to interactive tools, there exists social software bearing distinctive functions and features from interactive tools, which can be regarded as other types of social software.

The present study

The relationship between interactive tools and personality model is relatively well-established in existing literatures. However, almost no researchers look into the differences in the use of different social software, i.e., the functions they provide, the design purposes they hold, and the target groups they aim for. Taking different social software Weibo, WeChat and BOSS as examples. Weibo mainly focuses on content, which applies many untraditional forms (e.g., videos) and can be spread in a wide range. Users of Weibo may prefer to follow the lives of others. WeChat mainly focuses on communication and has the characteristics of instant information transmission. People who use WeChat may prefer to contact with others around them. BOSS is a goal-oriented platform for finding jobs. Factors like demand and acceptance may affect people's activeness of use. Based on these differences, it is unreasonable to roughly assume that all social software shares the same characteristics and will have the same impact on the users. Therefore, it is more rigorous and comprehensive to classify social software into different types and discuss their features and effects specifically.

The present study classifies social software into interactive tools, communicative tools and group tools, believing that the existing works fail to comprehensively evaluate the relations as they only research on one type of social software, i.e., interactive tools. Under such circumstance, it is necessary to ask a series of questions: 1) whether the relations between the use of other types of social software and personality share the same patterns as interactive tools do, 2) to what extent can other types of social software reflect the user's personality, 3) Whether the preferences to, time spent on, and using frequencies of different types of social software can indicate personality. The current proposed study will bridge this research gap by studying the relations between the use of different types of social software and personality, and the relations between users' tendency on using different types of social software and personality (see architecture as figure 2). Bridging this gap can enrich the theoretical understanding on how personal characteristics impact their daily use of social software comprehensively and shed light on the practical use, e.g., activity organization, job recruitment, etc.

Interactive tools, communicative tools and group tools

Social software can be classified into three types: interactive tools, communicative tools and group tools. For **interactive tools**, e.g., Social Networking Sites (Weibo, Twitter), they have the following characteristics: 1) anonymity, 2) recommendation, 3) openness, and 4) information instantaneity. Anonymity means except for a few users identified by the officials of the app, e.g., famous people, government accounts, the real identities of the most users are unknown to each other. The information shown in the user profile is the only way to reveal the user. But in most cases, the genuineness and effectiveness of the information cannot be verified. In other words, users only know there is a person behind the user ID without having any images of the person. Besides, users follow others, search, browse, comment and share contents without informing or requiring consents from the owners. For recommendation, the total number of posted contents in the interactive tools is significantly larger than any individual's capacity of viewing. To identify attractive posts and increase user adherence, technologies, e.g., recommendation algorithms, artificial intelligence, are used to guess users' preferences and interests, and push their favorite contents to the users. Openness means the contents posted by users can be spread in a large range, which is not limited to owners' friends, but the followers, the followers of the followers, and even all of the users. Information instantaneity means when a certain number (or above) of users post, share, comment some contents of the same topic, the topic will be shown on a prioritized list and informed to other non-participating users, e.g., Weibo Hot Search, Twitter Trends. Users then have better knowledge of the unfamiliar yet popular topics and information.

The second type is **communicative tools**, e.g., WeChat, WhatsApp, which typically handle the capturing, storing and presentation of communication, usually written but increasingly including audio and video as well (Allen, 2011). Communicative tools have the following characteristics: 1) recognition, 2) boundedness, 3) self-selection, 4) construction, and 5) communication instantaneity. For recognition, when adding other users to the contact lists, the users' identities are known in advance. It is possible that someone is added to the list without its true identity due to certain purpose, e.g., job interview, shopping, but at least some genuine information is linked to the person. From the perspective of communicative tools, the statuses of all the users are equal. For boundedness, contents can only be shared among the users added to the contact lists. For self-selection, users subscribe and receive the information they want. Contents which they do not subscribe are rarely pushed to them, which is distinctively from interactive tools. The constructive property means users can give their contacts various privileges and assign them into different groups at their will. Conversations and contents are made and shared only within certain groups. Communication instantaneity means upon sending the messages to the receiver, the communicative tools on the receiver sides immediately notice

the receiver of the arrival of the new messages. The interval between the time when the message is sent and the time when it is received and informed is short, typically hundreds of milliseconds, based on the distance and network conditions.

Group tools are customized for specific groups of people, who use these tools due to specific purposes to meet their needs. Examples include the job recruitment website BOSS, the dating website Match, the topic community Quora and the game forum Steam. Group tools have the following characteristics: 1) qualification-driven, 2) recommendation, 3) peer identity, 4) expenses, and 5) fulfilment instantaneity. The qualification-driven property means users show their personal information, e.g., education, wealth, experiences, to prove their capabilities for fulfilling certain purposes. Higher successful rate of achieving users' goals is linked to illustrating more relevant information, e.g., displaying detailed working and education experiences is usually connected with efficient job hunting. For recommendation, like interactive tools, based on the visiting records, group tools guess the users' preferences and interests, and more relevant items are introduced to the users. Peer identity means group tools gather people who bear similar needs and purposes. Users are homogenous, as they have similar purposes and faces similar challenges. Through the acts to achieve the goals, they are likely to feel similar kinds of happiness, doubts, anxiety, and concerns, which brings them senses of belonging. For expenses, the basic functions of the group tools are free of charge in most cases. But the advanced functions tend to be non-free, as these tools are usually profitable. For example, BOSS charges for accurate recommendations for jobs and Match charges for the complete information of the ideal objectives. Fulfilment instantaneity means when the users effectively use the group tools, their corresponding needs are simultaneously being satisfied. The group tools are made for specific purposes. The information and functions of the tools are specialized and purposeful. Hence, the use of the group tools is equivalent to achieving goals via the functions the tools provide.

Noticeably, different kinds of social software are trying enhancing their comprehensiveness and promoting the functional diversification. For example, interactive tool Weibo introduces the function of one-to-one communication and communicative tool WeChat introduces WeSee as the video platform for large-scale interactions. Therefore, people may argue that there are no obvious boundaries for different kinds of social software. But attention should be paid to the software's primary functions, in other words, to the purpose of its original design. Interactive tools are designed to exchange contents in a large space, communicative tools are design to make conservation with existing and potential friends, while group tools are purpose-oriented, designed to meet practical (e.g., recruitment, love, game) needs.

The relations between use behaviors and personality

The relations between interactive tools and personality are well studied in existing literatures. The present study will focus on communicative tools and group tools.

Communicative tools. People using communicative tools outnumbered people using interactively tools (Statista, 2021). Yet the relations between personality and the use of communicative tools is still unclear. To better formulate the relations, we use BIG5 to describe personality. And the use of communicative tools is evaluated via the following factors: the number of daily chatting people, the length of daily using time, the variety of communication ways, the breadth and depth of conversations, and the positiveness. To be concrete, the number of daily chatting people and the length of daily using time reflect the size of users' active social circles and degrees of temporal involvement into online socialization. Communication ways include sending text, emoji, audio, video, sticker, and meme. People select the ways, which they believe to be the most capable ones, to effectively express and represent themselves. The breadth of conversions represents the diversity of topics. The depth of conversations represents active intellectual participations, meaning participants share their personal insights, thoughts, comments, advice, lessons about the topic and they argue, discuss to have better understanding. The positiveness reflects the participants' emotions and attitudes shown the conversion. Optimistic people tend to have more positive emotions than pessimistic people even when they face the same problems. We believe the aforementioned factors can accurately describe the use of communicative tools. Next, the relations between these factors and personality will be discussed.

Individuals high in openness have higher degree of acceptance to strange things and people. They are curious about the people, adventure, and unusual ideas. Therefore, when using communicative tools, they are more likely to chat with more people, use more various communication ways to express themselves, exchange more ideas on diverse topics, and show positive emotions and attitudes. Individuals who are conscientious strive for their goals with stringent self-discipline. They use precise, efficient ways to convey themselves. Hence, they tend to chat with fixed friends at fixed time, prefer simple communication ways with precise language, focus on the depth of conversations and seldom use emotional descriptions. Individuals who are high in extraversion have strong connections with external people and activities. They have more friends and regard communication as an important way to interact with external worlds. They are motivated by external worlds and become energetic and enthusiastic. So, they tend to chat with more friends and spend more time on communicative tools. The communication ways they use are more flexible and changeable, the topics they discuss are bread and deep, and the emotions they convey are mostly optimistic or passionate. Individuals who are high in agreeableness are helpful and considerate. They are likely to find

a harmonious relation between society and themselves. Therefore, they are accustomed to chatting with a group of people, following other people's time to chat, using more friendly communication ways, choosing topics that make others comfortable, and appreciating other people's emotions instead of their own. People high in neuroticism experience more negative feelings. They are more likely to be anxious, angry, and depressed. Hence, the friends they chat with and the time they spend on are less than average, the communication ways they choose tend to be emojis which do not express real-selves, the breadth and depth of chat topics are not worthy of their concern, and their chat contents are emotionalized. Therefore, it is proposed that:

H1: There will be a *positive* relationship between openness and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth of conversions and the positiveness respectively. And a *negative* relationship with the depth of conversation.

H2: There will be a *negative* relationship between conscientiousness and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth of conversions. And a *positive* relationship with the depth of conversation.

H3: There will be a *positive* relationship between extraversion and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth and depth of conversions and the positiveness.

H4: There will be a *positive* relationship between agreeableness and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth and depth of conversions and the positiveness.

H5: There will be a *negative* relationship between neuroticism and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth and depth of conversions and the positiveness.

Group tools. In addition to interactive and communicative tools, the relations between the use of group tools and personality should be studied. The use behaviors of group tools can be evaluated through the following ways: motivation for use, the interval between knowledge and first use, ways of participation, contact willingness, degree of acceptance, and willingness to pay. Specifically, the motivation for use can be classified into active and passive motivation. The active motivation means the decisions to use group tools are primarily made by users themselves with careful evaluation of their needs and purposes. For example, with the need to romance and marriage, Jack uses Match, the dating website, to find potential lovers. For passive motivation, the decisions are mainly from the influences of others (e.g., friends, family) and the corresponding needs are not urgent or definite. For example, Bob browses the information

on Match merely because his mother told him to do so. Bob himself does not have urgent needs to find a lover. The interval between knowledge and first use describes the intervals between the time when users first know the tools and the time when users first choose to use them. Ways of participation are active or passive. Active participation means users actively use the provided functions to satisfy their needs, for which the tools are designed. Examples of active participation for Quora, the question forum, include publishing the questions to be answered, searching related questions and answers to get relevant information. Passive participation means the primary concern is not the needs the tools target to. For example, Alice browses the questions recommended by the Quora system as a recreation way or find some topics to share with friends. Contact willingness is how much the users want to contact other peers and accept contacts from others. Degree of acceptance describes the attitudes towards the tools, as some users may feel uncomfortable even when they are using them out of urgent needs. Willingness to pay summarizes the money spent on the non-free functions provided by the tools. The use of group tools is decomposed into the aforementioned behaviors. Next, the relations between these behaviors and personality will be discussed.

Individuals who are high in openness have open minds and are curious about unknown things, including unfamiliar group tools. They are likely to be the pioneers and try the tools as they know them. Hence, the interval between knowledge and first use tends to be short. When facing the non-free functions, they are likely to spend money for the fresh experiences. They have higher degree of acceptance for these tools. However, people with high openness are less concentrated. They may lose focus and not carefully evaluate their needs. So, the motivation and ways of participation tend to be passive. For individuals who are high in conscientiousness, they are focused and purposeful. Their ways of participation and motivation are active by understanding their own needs and insisting on finding solutions. But conscientious people are linked with stubbornness in some cases. Before fully comprehend the benefits of the group tools and the charging advanced functions, they tend to be unwilling to try. Hence, the interval between knowledge and first use is long and their willingness to pay is relatively low. People who are high in extraversion are fond of external people and activities. It is through external means that they energize themselves. Hence, they are likely to have high degree of acceptance, as group tools bring them peers with similar purposes. Their contact willingness is high due to their inner drive to know external things. For individuals who are low in agreeableness, they are competitive, unwilling to turn to others for help or introduce their own experiences. Their contact willingness is low. People with high neuroticism have unstable emotional state. If they feel anxious and huge pressure about their problems, they will desperately search for effective solutions. If the conditions are not that urgent, their cowardness and pessimism stop them make

practical moves. Hence, they tend to fall into extreme situations. The interval of knowledge and first use, willingness to pay, are extremely high or low based on conditions. Besides, they lack people in reality to express their feelings and hardship. Having few people to trust makes their contact willingness low. Therefore, it is proposed that:

H6: There will be a *positive* relationship between openness and willingness to pay, degree of acceptance respectively. And a *negative* relationship between openness and motivation for use, the interval between knowledge and first use, and ways of participation.

H7: There will be a *positive* relationship between conscientiousness and the interval, the motivation and ways of participation. And a *negative* relationship with the willingness to pay.

H8: There will be a *positive* relationship between extraversion and degree of acceptance, contact willingness.

H9: There will be a *positive* relationship between agreeableness and contact willingness.

H10: There will be a *negative* relationship between neuroticism and contact willingness. And extreme conditions between neuroticism and interval, willingness to pay.

The relations between use tendency and personalities

After evaluating different types of social software separately, it is necessary to explore the relations between the comprehensive use of social software and personality. Hence, we analyze the use tendency and its relations to personality. Tendency means a proneness or preference to a particular kind of thought or action. Use tendency to certain types of social software can be measured by the time they spent on it per day, including frequency and duration (i.e., use once a day, 30 minutes each time is equivalent to three times a day, 10 minutes each time). For better quantification, three levels of degree will be defined to analyze the proportion of time spend on each tool, i.e., dominate, relative and average. Dominate degree means among the three types of tools, the use of one is dominant. For example, the total amount of time spent on social software is 10 and their corresponding ratio is 7 to 2 to 1 or 4 to 3 to 3. Relative degree means among the three types of tools, the figures of two types are the similar and relatively high. For example, the total amount is 10 and their ratio is 4 to 4 to 2. Average degree means the figures of three types of tools are approximately the same, that is 1 to 1 to 1. Both dominate and relative degree signify their tendency on using certain types of tools.

Openness. Individuals high in openness have the courage to try something new. Based on the features of people with openness, their using tendencies are as follows. They surf on the internet with eagerness and creativeness, want to grasp the latest news immediately, and respond to it based on their imagination or intelligence. This kind of participation in external things guides them to use interactive tools more often. Furthermore, they are more likely to use group tools. Because of the higher degree of accepting new things, when demand emerges, they

are willing to and even eager to try untraditional tools to meet their needs. In this process, they are careless about whether to pay for the tools and excited to nurture peer relationships. In addition, whether it is in interactive tools or in group tools, they expect relevant content based on their browsing footprints to be recommended by technology, and believe that this recommendation enriches their information and makes them have better senses of participation. Therefore, it is proposed that:

H11: Among the three types of tools, people with higher openness are more inclined to use interactive tools and group tools.

Conscientiousness. People with a higher degree of conscientiousness are more self-disciplined and more organized in doing things. Based on the characteristics of different tools, judgement can be inferred that they are more likely to use communicative tools. The recognitive property of communicative tools determines that its users are supposed to show a sense of responsibility and reliability, since everyone wants to put up a good image in the circle of their friends. The self-selection of information indicates that the users will not be disturbed by recommendation, i.e., they don't need to spend time on things that are far from their purposes. The communication instantaneity allows users to use it efficiently and conveniently. These all cater to the character traits of a conscientious person. Therefore, it is proposed that:

H12: Among the three types of tools, people with higher conscientiousness are more inclined to use communicative tools.

Extroversion. Individuals who are more extrovert tend to be enthusiastic and gregarious. They enjoy participating in various activities and are passionate about life. Based on the features of people with extroversion, it can be inferred that they are more likely to use interactive tools and communicative tools. They enjoy a higher social participation and interaction, which let them be passionate about social events and trivia around them. When participating in events, they hope that they are not only participants, but also creators, which shows they appreciate putting forward and exchanging ideas with others. Therefore, it is proposed that:

H13: Among the three types of tools, people with higher extroversion are more inclined to use interactive tools and communicative tools.

Agreeableness. Individuals higher in agreeableness are considerate, trustworthy, and concern more about social harmony. Based on the features of people with agreeableness, their using tendencies are as follows. They prefer to use communicative tools. They like to communicate with others, especially familiar people. They pay attention to other people's emotions, and want to be cared at the same time. When communicating with others, they are full of emotions, which will not be interrupted due to the communication instantaneity.

Therefore, their preferences and needs can be satisfied through communicative tools. Furthermore, they are more likely to use group tools. They prefer to participate in group activities, and willing to find more people who share the same interests as themselves. They tend to have a good sense of use since they are sincere, generous, easier to trust and trusted by others when using group tools. Therefore, it is proposed that:

H14: Among the three types of tools, people with higher agreeableness are more inclined to use communicative tools and group tools.

Neuroticism. People with higher neuroticism tend to be emotional, i.e., they are more easily to fall into anxiety, tension and panic about what is going to happen. Based on the features of people with neuroticism, it can be inferred that they are more likely to use interactive tools and group tools. Most of them have social phobia, in other words, they are afraid of communicating directly with other people. Being Compared with peers makes them feel anxious, and chatting with unfamiliar people makes them feel uncomfortable. In this case, the anonymity of interactive tools provides them with a good protection. When people feel anxious or pessimistic about life, the subconscious reaction is to change the situation. Driven by this purpose-oriented, they are willing to use group tools to relax themselves or solve problems. It is worth noting that the peer identity of group tools makes them realize that they are not alone. Thus, they have tendency to use and rely on such tools. Therefore, it is proposed that:

H15: Among the three types of tools, people with higher neuroticism are more inclined to use interactive tools and group tools.

Method

Participants

The proposed participants of this study will be college and graduate students from Renmin University of China. Young adult students (age 18-26 years old) are core users of various most popular social software in China. For example, among people who are 18-26 years old, 80% are Weibo users (Weibo Research Center, 2020); 70% are Zhihu users (Zhihu Research Center, 2019); the number of users of WeChat is 1.2 billion, which is almost close to the total population, there is no doubt that young people are also WeChat users. Therefore, it is reasonable to take young adult college and graduate students as the proposed participants.

Research procedures

First, for participant recruitment, online invitations will be sent to each class or through the university's mail system. Participants are told that they will participate in a study on the connection between social software use and personality prediction. If participants are interested, they will be directed to an online survey of related issues. In the survey, upon reading and

signing the consent form to agree to participate in the study, participants will first read the descriptions of the study and general instructions. Afterwards, participants will complete the measurements of the study. Participants will first complete the measurements on personality through self-evaluation and objective evaluation, and then move to the measurements on specific behaviors in using a certain type of social software, and then take the measurements on the tendency of using different social software. In this study, personal personalities will be measured based on BIG5 indicators, the use behaviors of social software will be measured separately in the light of the characteristics of different social software, and the tendency of social software use will be measured by two indicators, i.e., frequency and duration. Finally, participants will complete the measurement of the control variables and answer questions about demographics. After completing the survey, participants will be debriefed and thanked.

Measures

Five Factor Model.

In the present study, personal personality will be measured based on BIG5 – openness to experience, conscientiousness, extraversion, agreeableness and neuroticism.

Openness to experience. People who are open to experience are intellectually curious, open to emotion, sensitive to beauty and willing to try new things (Ambridge, 2014). In the first part, some keywords will be given to participants, such as curious, intelligent and imaginative. Participants will evaluate whether these keywords are in line with them based on self-evaluation, and classify themselves into the Openness model. Objectively evaluation will be measured by using items proposed by International Personality Item Pool (IPIP) (e.g., "I am full of ideas." "I am quick to understand things") on a 5-point scale (1= *strongly disagree*, 5 = *strongly agree*).

Conscientiousness. It is related to the way in which people control, regulate, and direct their impulses (Toegel & Barsoux, 2012). In the first part, some keywords will be given to participants, such as responsible, organized and persevering. Participants will evaluate whether these keywords are in line with them based on self-evaluation, and classify themselves into the conscientiousness model. Objectively evaluation will be measured by using items proposed by International Personality Item Pool (IPIP) (e.g., "I am always prepared." "I give attention to my duties") on a 5-point scale (1= *strongly disagree*, 5 = *strongly agree*).

Extraversion. The trait is marked by pronounced engagement with the external world. Extraverts enjoy interacting with people, and are often perceived as full of energy (Friedman & Schustack, 2016). In the first part, some keywords will be given to participants, such as outgoing, amicable and assertive. Participants will evaluate whether these keywords are in line with them based on self-evaluation, and classify themselves into the extroversion model.

Objectively evaluation will be measured by using items proposed by International Personality Item Pool (IPIP) (e.g., "I feel comfortable around people." "I am the life of the party.") on a 5-point scale (1= *strongly disagree*, 5 = *strongly agree*).

Agreeableness. Agreeable individuals value getting along with others and have an optimistic view of human nature (Rothmann & Coetzer, 2003). In the first part, some keywords will be given to participants, such as cooperative, helpful and nurturing. Participants will evaluate whether these keywords are in line with them based on self-evaluation, and classify themselves into the agreeableness model. Objectively evaluation will be measured by using items proposed by International Personality Item Pool (IPIP) (e.g., "I feel others' emotions." "I am interested in others.") on a 5-point scale (1= *strongly disagree*, 5 = *strongly agree*).

Neuroticism. It is sometimes called emotional instability and interlinked with low tolerance for stress or aversive stimuli (Norris, Larsen, & Cacioppo, 2007). In the first part, some keywords will be given to participants, such as anxious, insecure and sensitive. Participants will evaluate whether these keywords are in line with them based on self-evaluation, and classify themselves into the neuroticism model. Objectively evaluation will be measured by using items proposed by International Personality Item Pool (IPIP) (e.g., "I get irritated easily." "I get stressed out easily.") on a 5-point scale (1= *strongly disagree*, 5 = *strongly agree*).

The use behaviors of communicative tools and group tools.

Communicative tools. Five factors will be considered to evaluate the use behaviors of communicative tools: the number of daily chatting people, the length of daily using time, the variety of communication ways, the breadth and depth of conversations, and the positiveness. Specifically, the number of daily chatting people will be classified into three degrees, e.g., less than 3 persons, 4 to 6 persons, and more than 7 persons. The length of daily using time will count for the total time. The function of software time statistics of the mobile phone system can help participants a lot. This item is also considered from three degrees, e.g., less than one hour, one hour to two hours, and more than two hours. Communication ways include sending text, emoji, audio, video, sticker, and meme. Participants will choose one or more way (s) from these items, and supplement are allowed. The breadth of conversions will be measured by how many topics they usually talk to with their chat partners a day. Quantitative options include, only one (for specific needs), less than ten (according to recent events), and plenty of (anything occurred in mind). The depth of conversations is measured by how long a certain topic lasts and how much energy they put in. Participants will recall the time and energy they spent on a topic, and make judgments about whether the topic is in-depth based on their own situation. And choose how many in-depth conversations they have with others a day. Options include,

none, once, two to four times, and more than four times. The positiveness will be measured by observing the emotional vocabularies and emotions expressed by participants in the conversation, and this category are including positive, negative and non-emotional.

Group tools. The use behaviors of group tools will be evaluated through the following factors: motivation for use, the interval between knowledge and first use, ways of participation, contact willingness, degree of acceptance, and willingness to pay. Specifically, the motivation for use will be classified into active (motivated by self-needs) and passive (pushed by others) motivation. The interval between knowledge and first use describes the intervals between the time when users first know the tools and the time when users first choose to use them. There are four options for this item, i.e., immediately, observe for a few days, wait for favorable comments on software, and favorable comments as well as urgent needs. Ways of participation are active or passive. This item will be measured by the following behaviors, and the positive degree of these behaviors is getting stronger and stronger. Examples are browse, search, like, collect, comment, share and post. Contact willingness is how much the users want to contact other users (also peers with similar needs) for the purposes. This item will be measured by collecting how many people they contacted with in total. The options include less than 20 people, 20 to 50 people, 50 to 80 people, and more than 80 people. Degree of acceptance will be measured by asking questions like do you feel comfortable when using this software, and the results are displayed on a 5-point scale (1= *strongly discomfortable*, 5 = *strongly comfortable*). By asking have they ever paid for and how much have they spent on these tools, their willingness to pay is obvious.

The use tendency of different types of social software.

In the present study, tendency on using social software will be measured by the time users spend on it every day, two indicators, frequency and duration are included.

Frequency. Participants report the average frequency on their daily use of different types of tools on a 5-point scale (1= never, 2 = once a day, 3 = less than five times a day, 4 =less than ten times a day, 5 = more than ten times a day).

Duration. Participants report the average duration in which they engage in different tools each time on a 5-point scale (1= less than 20 mins, 2 = 30 mins, 3 = 40 mins, 4 = 50 mins, 5 = more than one hour). The function of the mobile phone system to record the time spent by each software can help participants a lot.

The final results are frequency multiplied by duration.

Demographic.

Participants' demographic information will also be collected, including their age, gender, race/ethnicity.

Result

Analysis plan

To test the proposed hypotheses in the present study, structural equation modeling (SEM) will be used. In addition, this paper will study two situations at the same time. In the first case, there are five factors of personalities and three types of tools, but only two tools, communicative tools and group tools will be studied in this paper. Therefore, there will be a total of ten SEMs, with two SEMs for each personality model. For example, in all two SEMs for openness, the independent variable is openness, with the first mediator being communicative tools, and the second being group tools. The dependent variable, different use behaviors, is different in each of the two SEMs for openness. Lastly, in all two SEMs for openness, demographic are control variables.

In the second case, there are five factors of personalities and one (or two) tendency (or tendencies) on using specific tools. social software. According to the previous hypothesis, there will be one SEM for conscientiousness, and respectively two SEMs for openness, extroversion, agreeableness and neuroticism. For example, in the SEMs for openness, the independent variable is openness, with the mediator being three types of social software. The dependent variable is the tendency on using certain social software. Similarly, the demographic are control variables.

The analyses of the other four personality factors (i.e., conscientiousness, extraversion, agreeableness and neuroticism) is the same as openness.

Expected findings

H1 to H10 proposes the relations between the users' behaviors on communicative (group) tools and personalities. It is expected to find that users' personalities are strongly connected with their use behaviors on communicative (group) tools. That is, to some extent, users' personalities can be predicted by observing their use behaviors. For example, for H1, it is expected to find a positive relationship between openness and the number of chatting people, the length of daily using time, the variety of communication ways, the breadth of conversions and the positiveness. And a negative relationship between openness and the depth of conversations. For H6, it is expected to find a positive relationship between openness and willingness to pay, degree of acceptance, a negative relationship between openness and motivation for use, the interval between knowledge and first use, and ways of participation. Similarly, all other aspects of Hypothesis 1 and 2 should be verified.

H11 to H15 propose the relations between users' tendency on using different tools and their personalities. It is expected to find that the users' preferences on different tools can indicate their personalities. That is, to some extent, users' personalities can be predicted by observing

their using tendency. For example, for H11, it is expected to find that among the three types of tools, people with higher openness are more inclined to use interactive tools and group tools. Similarly, H12 to H15 are supposed to be confirmed.

Discussion

Theoretical implications

The expected findings of this proposed study highlight that there is a strong connection between social software use and personality. Existing studies have investigated the relationship between use behaviors and personality, but they limited the scope of the research to only one category, i.e., interactive tools. Few scholars classify social software and discuss them in detail. The present study classifies social software into three categories, based on their different use purposes, target groups, design concepts, e.t.a. Clearly statements are given to define the differences of various social tools and their boundaries, which are expected to bridge this theoretical gap. Based on this classification, future researchers can conduct more detailed, clearer, and more comprehensive studies on this issue. Other related researches on communication can share this comprehensive perspective to advance their researches as well, e.g., supportive communication.

Practical implications

The relationship between individual's behaviors and tendencies on using different social software and their personality is a two-way street. Therefore, the practical implications of the present study can be inspired from the following two aspects. On the one hand, social software use can reflect personality. People's personality is not set in stone. Depending on the things they experience, the knowledge they grasp and the friends they get along with, the dominant factors of their personality will change. Therefore, by observing people's using behaviors and tendencies, their psychological states can be better noticed. This is not only conducive to individual development, but also conducive to social harmony. On the other hand, personality can predict social software use. For software designers or event organizers, by making a rough estimate of the personality of the target population, they can group the target population into different category, launch different types of tools or focus on different functions, so as to maximize efficiency and benefits.

Limitations and future directions

This proposed study has several limitations. First, predicting users' personality from digital footprints of social software is a challenging task as the context of identifying personality traits in social software is not trivial. Users behave differently in social software and real life (Ahmed Al Marouf, Md. Kamrul Hasan, & Hasan Mahmud, 2020). Therefore, we can only have a rough prediction of the user's personality. Future research could replenish current work by

investigating how and to what extent users behave differently in real life and social software. Second, different social tools are working to increase their functional diversity, and some of their features are converging. For example, WeChat, a communicative tool, not only has the function of communication, but also has the function of Moments, which is deeply loved by people. When looking at how much time people spend on WeChat, it's hard to quantify exactly the time they spend on communication and other functions. Future research could use more advanced algorithms or conduct more specific experiments to test different time spent by controlling variables. Lastly, the present study only proposes to use college student samples, as they are primary users of some of the most popular social software in China (Statista, 2021). Findings from this study cannot be generalized to other age groups. Future research may need to test the proposed hypotheses in other groups of social software users.

Conclusion

Social software has permeated almost every aspect of our lives, and even become the main way for people to communicate. It is reasonable and necessary to study the relationships between social software and human personality. Existing research has examined the relationship in detail, but detail is not the same as comprehensiveness. Former researches mainly focused on interactive tools, while social software includes communicative tools and group tools as well. The present study is trying bridging this gap. First, clear definitions are given to line the boundaries and characteristics of different tools. Then, further explanations are given to describe what behaviors users may have when using different social tools, as well as the relationship between these behaviors and their personality. Finally, the relationship between their tendency of using different tools and personality is also worth paying attention to. Although the existing work has the shortcomings mentioned in the above limitations, it is of great theoretical significance to classify and define social software. Future works are expected to focus on the deficiencies and improve the present study in a more comprehensive way.

References

Allen, C. (2004). *Tracing the Evolution of Social Software.*

Back, M. D., Stopfer, J. M., Vazire, S., Gaddis, S., Schmukle, S. C., Egloff, B., and Gosling, S. D. (2010). Facebook Profiles Reflect Actual Personality, Not Self-Idealization. *Psychological Science, 21(3)*, 372-374.

Hall, A. (2005). Audience Personality and the Selection of Media and Media Genres. *Media Psychology, 7*, 377.

Pornsakulvanich, V., Haridakis, P., and Rubin, A. M. (2008). The Influence of Dispositions and Internet-use Motivation on Online Communication Satisfaction and Relationship Closeness. *ScienceDirect, 24(5),* 2292-3310.

Larose, R., Mastro, D. and Eastin, M. S. (2001). Understanding Internet Usage: A Social-Cognitive Approach to Uses and Gratifications. *Social Science Computer Review, 19*, 397.

Seidman, G. (2013). Self-presentation and belonging on Facebook: How personality influences social media use and motivations. *Personality and Individual Differences, 54(3)*, 402–407.

Ambridge B (2014). Psy-Q: You know your IQ – now test your psychological intelligence. *Profile (11)*.

Toegel, G., Barsoux, J. L. (2012). How to become a better leader. *MIT Sloan Management Review, 53 (3)*, 51–60.

Friedman, H., Schustack, M. (2016). Personality: Classic Theories and Modern Research (Sixth ed.). *Pearson Education Inc.*

Rothmann, S., Coetzer, E. P. (2003). The big five personality dimensions and job performance. *SA Journal of Industrial Psychology,* 29.

Norris, C. J., Larsen, J. T., and Cacioppo, J.T. (2007). Neuroticism is associated with larger and more prolonged electrodermal responses to emotionally evocative pictures. *Psychophysiology, 44 (5)*.

Elihu, K. (1959). Mass Communications Research and the Study of Popular Culture: An Editorial Note on a Possible Future for this Journal. *Departmental Papers (ASC),* 1–6.

Liu, D. and Campbell, K. W. (2017). The Big Five personality traits, Big Two meta-traits and social media: A meta-analysis. *Journal of Research in Personality, 70*, 229–240.

Escobido, M. and Stevens, G. (2013). Can personality type be predicted by social media network structures? *The Asian Conference on Psychology & the Behavioral Sciences.*

Al Marouf, A., Hasan, Md. K. and Mahmud H. (2020). Comparative analysis of feature selection algorithms for computational personality prediction from social media. *Ieee transactions on computational social system, 7(3)*.

Liu and Zhu (2016). Deep learning for constructing microblog behavior representation to

identify social media user's personality. *PeerJ Comput.*

John, O. P., and Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of personality: Theory and research*, 102–138. New York, NY: Guilford Press.

Seidman, G. (2013). Self-presentation and belonging on Facebook: How personality influences social media use and motivations. *Elsevier: Personality and Individual Differences, 54,* 402–407.

Azucar, D., Marengo, D., and Settanni M. (2018). Predicting the Big 5 personality traits from digital footprints on social media: A meta-analysis. *Elsevier: Personality and Individual Differences, 124,* 150-159.

Lin, Han, Ramsay, J. and Fang (2012). You are what you tweet: Personality expression and perception on Twitter. *Elsevier: Journal of Research in Personality, 46,* 710–718.

Figure 1: Five Factor Model（BIG5）		
High score	Model	Low score
curious, intelligent, imaginative, unconventional, risk, lack of focus	**Openness to experience** is a general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience.	pragmatic, conventional, Non-analytical, dogmatic,
stubborn, organized focused, discipline, insistent	**Conscientiousness** is a tendency to display self-discipline, act dutifully, and strive for achievement against measures or outside expectations.	flexible, spontaneous, lack of reliability
enthusiastic, action-oriented, optimistic, gregarious	**Extraversion** is characterized by breadth of activities (as opposed to depth), surgency from external activity/situations, and energy creation from external means.	quiet, low-key, deliberate, independent
considerate, kind, generous, helpful, trustworthy	**Agreeableness** trait reflects individual differences in general concern for social harmony.	competitive, argumentative, untrustworthy
anxiety, pressure, pessimistic, emotionally reactive	**Neuroticism** is the tendency to experience negative emotions, such as anger, anxiety, or depression.	calm, relax, emotionally stable, courageous

Figure2: Architecture